REMARKS

Reconsideration of the application is respectfully requested for the following reasons:

1. Objection to Drawings

This objection has been addressed by amending the specification to refer to the –source– rather than "emitter" of the FET/IGBT device.

2. Claim Objections and Rejection Under 35 USC §112, 2nd Paragraph

The objections set forth in item 2 on page 2 of the Official Action, and the rejection under 35 USC §112, 2nd Paragraph have been addressed by complete re-writing the claims to be in proper U.S. format. In addition, the specification and abstract have been amended to correct numerous grammatical and idiomatic errors.

Having thus overcome each of the objections and non-prior art rejections made in the Official Action, withdrawal of the objection and rejections, and early and favorable action on the merits, is requested.

Respectfully submitted,

BACON & THOMAS, PLLC

Date: March 22, 2004

By: BENJAMIN E. URCIA
Registration No. 33,805

BACON & THOMAS, PLLC
625 Slaters Lane, 4th Floor
Alexandria, Virginia 22314

Telephone: (703) 683-0500

MARKED-UP COPY OF
ORIGINAL SPECIFICATION
Ser. No. 09/964,323
Examiner K. Pyo
Group Art Unit 2878

TITLE: TRANSISTOR PHOTOELECTRIC CONVERSION DRIVE CIRCUIT

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention relates to an photoelectric conversion drive circuit of a transistor, and more particularly, to one that ~~comprised of~~ includes a matching electric energy driven light emission device, e.g. an LED, a light bulb, or any other type of ~~photoelectric conversion~~ light emission device or natural light source ~~in the environment~~; ~~an~~ a device coupled to the matching photoelectric conversion light emission device, such as ~~an~~ the electricity storage device of ~~an photo to electric energy~~ a photoelectric crystal or a non-crystal system for causing the light emission device to emit light; and a ~~voltage type drive electric energy~~ photoelectric effect device that generates micro-current when subject to light, for transmission to a high input resistance type of transistor, such as a micro or power type metal-oxide-silicon field effect transistor (MOSFET), ~~or~~ insulated gate ~~bi-carrier~~ bipolar transistor(IGBT), or other high input resistance transistor, or a gate and ~~emitter~~ source of a ~~modulus~~ high input resistance transistor module ~~for driven conduction~~ to cause the transistor or module to conduct. ~~Meanwhile, a drive electric energy of a positive voltage is~~ and to simultaneously ~~used to~~ supply electric energy for storage by a ~~circuit device of~~ slave type ~~of~~ negative voltage circuit device so that upon ~~cutting~~ cut off, a negative voltage is generated ~~to~~ for input to the gate and ~~emitter~~ source of one or more than one high resistance transistors for facilitating the cut-off.

(b) Description of the Prior Art:

A high input resistance transistor such as a metal-oxide-silicon field effect transistor (MOSFET), ~~or~~ an insulated gate ~~bi-carrier~~ bipolar transistor IGBT, or any other type of high input resistance transistor or ~~modulus~~ module ~~is known as a solid state transistor device voltage with~~ having its operation controlled by a drive voltage ~~that~~ has

been developed only in recent years. In addition to functioning as a solid-state high power switch, the high input resistance transistor ~~is convenient to~~ may conveniently be applied in a micro-electronic logic operation or data memory storage circuit device, ~~or~~ a detection circuit device, or other circuits. However, the input end for controlling the operation of the high input resistance transistor, e.g., a MOSFET, IGBT or other types of high input resistance transistor or ~~modulus~~ module, is of high resistance type. The matching current of its drive signal is very small (approaching zero). Since the drive voltage must reach a pre-set value to ensure of normal operation, a larger resistance is observed between ~~collector and emitter~~ drain and source if the voltage between the gate and ~~emitter~~ source gets too low, and thus the high resistance input transistor may ~~get~~ be burnt out due to increased thermal loss. Such a disadvantage ~~makes~~ limits application of the transistor ~~be somehow limited when applied in the occasion with~~ in applications involving an occasionally lower input voltage. ~~A drawing of working characteristics of the high input resistance transistor using an IGBT as example is attached to this application.~~ Preferably, the drive signal for the IGBT should not be less than 12V.

SUMMARY OF THE INVENTION

The primary purpose of the present invention is to provide a drive circuit ~~to drive~~ for a metal-oxide-silicon field effect transistor (MOSFET), ~~or~~ an insulated gate ~~bi-carrier~~ bipolar transistor (IGBT), or any other type of high input resistance transistor, ~~by having~~ in which an electric energy driven light emission device or an environmental light source is used to excite a device coupled to the photoelectric conversion light emission device or environmental light source, and cause the light emission device or light source to generate electric energy of positive voltage; and to ~~generate~~ supply a negative voltage to the gate and emitter of one or more than one high resistance transistor to facilitate cutting off of the at least one transistor without a sudden drop in the gate to source voltage.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block ~~chart~~ diagram showing a basic circuit of a photoelectric conversion transistor drive circuit ~~of~~ according to the present invention ~~of a transistor~~,

Fig. 2 is a view showing ~~that the present invention is~~ in parallel ~~with induction to form~~ a slave negative voltage supply circuit including a parallel-connected inductor,

Fig. 3 is a view showing ~~that the present invention is in parallel with induction and capacitors to form~~ a slave negative voltage supply circuit including a parallel-connected inductor and capacitor,

Fig. 4 is a view showing ~~that the present invention is in series with induction to form~~ a slave negative voltage supply circuit including a series-connected inductor,

Fig. 5 is a view showing ~~that the present invention is~~ in series with induction and capacitors in parallel to form a slave negative voltage supply circuit,

Fig. 6 is a view showing ~~that the present invention is in series with resistance and secondary battery to form~~ a slave negative voltage supply circuit including a series-connected resistance and secondary battery,

Fig. 7 is a view showing ~~that the present invention is in series with~~ a series-connected zener diode and secondary battery arranged to form a slave negative voltage supply circuit,

Fig. 8 is a view showing ~~that the present invention is in parallel with~~ a parallel-connected pressure effect system ~~of~~ having a pre-stressed structure and arranged to form a slave negative voltage supply circuit,

Fig. 9 is a view showing ~~that~~ a slave negative voltage supply circuit ~~is comprised of the present invention and an~~ including a series-connected, inverse polarity photoelectric conversion device ~~in series of inverse polarity with drive signals~~,

Fig. 10 is a view showing ~~that~~ a slave negative voltage supply circuit ~~comprised of having connected the output from a device coupled to a~~ in which the photoelectric conversion light emission device of the present invention is connected in series with a

zener diode and ~~capacitors~~ a capacitor,

Fig. 11 is a view showing a circuit ~~wherein the present invention~~ provided with a negative voltage storage device that simultaneously excites two photoelectric conversion ~~device~~ devices connected in series of inverse polarity coupled to the electric light emission device from a signal source,

Fig. 12 is a view showing another circuit ~~wherein the present invention~~ provided with a negative voltage storage device that simultaneously excites two photoelectric conversion device connected in series of inverse polarity coupled to the electric light emission device from a signal source,

Fig. 13 is a view showing a circuit ~~wherein the present invention is adapted by means of~~ including two electric energy driven light emission ~~device~~ devices ~~driven by electric energy polarity selection~~ connected to two photoelectric conversion device connected in parallel ~~of~~ with inverse polarity,

Fig. 14 is a view showing a circuit wherein two individual electric energy driven light emission devices are used ~~by the present invention~~ to control the operation of two photoelectric conversion devices connected in parallel ~~of~~ with inverse polarity,

Fig. 15 is a view showing another circuit wherein two individual electric energy driven light emission device are used ~~by the present invention~~ to control the operation of two photoelectric conversion ~~device~~ devices connected in parallel ~~of~~ with inverse polarity,

Fig. 16 is a ~~first~~ preferred embodiment of the present invention comprised of a constant negative electric energy device,

Fig. 17 is a ~~second~~ preferred embodiment of the present invention also comprised of a constant negative electric energy device, and

Fig. 18 is ~~a third~~ another preferred embodiment of the present invention comprised of a constant negative electric energy device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

~~The present invention relates to an photoelectric conversion drive circuit of a transistor, and more particularly, to one that comprised of a matching electric energy driven light emission device, e.g. an LED, a light bulb, any other type of photoelectric conversion light emission device or natural light source in the environment; an device coupled to the matching photoelectric conversion light emission device, such as an electricity storage device of an photo to electric energy crystal or a non-crystal system; and a voltage type drive electric energy that generates micro-current when subject to light, for transmission to high input resistance type of transistor, such as a micro or power type metal-oxide-silicon field effect transistor (MOSFET) or insulated gate bi-carrier transistor (IGBT) or other high input resistance transistor or a gate and emitter of a modulus for driven conduction. Meanwhile, a drive electric energy of a positive voltage is used to supply electric energy for storage by a circuit device of slave type of negative voltage so that upon cutting off, negative voltage is generated to input to gate and emitter of one or more than one high resistance transistors for facilitating the cut-off.~~

Fig. 1 is a block ~~chart~~ diagram showing a basic ~~circuit of a~~ photoelectric conversion drive circuit ~~of~~ for a transistor ~~of~~ according to the present invention. The photoelectric conversion drive circuit illustrated in Fig. 1 is essentially comprised of:

- a high input resistance transistor Q101~~: comprised~~ made up of one or more than one ~~various types~~ type of high input resistance transistor devices, including ~~one unit one polarity~~ single unit, single polarity devices or devices made up of two units inversely connected in parallel, or a bridge type ~~modulus~~ high input resistance transistor such as ~~an active device comprised of~~ a metal-oxide-silicon field effect transistor (MOSFET) or an insulated gate ~~bi-carrier~~bipolar bipolar transistor (IGBT), or other high input resistance transistor ~~or~~, ~~modulus~~, transistor module, or gate, or ~~constitutes~~ a logic operation or data memory storage system, ~~or~~ detection ~~circuit~~ device, or ~~constitutes~~ other circuit that is driven by ~~receiving electric energy drive signal of~~ a positive voltage drive signal~~, or one or more than one an photoelectric conversion devices PE101 is~~

~~provided for joint or individual matching as maybe required to drive the high input resistance transistor Q101~~;

- a photoelectric conversion device PE101~~: comprised~~ made up of a crystal or non-crystal system photo device that generates electric energy output when subject to light, or ~~of~~ other type of photoelectric conversion device arranged to receive photo energy from an environmental light source or an electric energy driven light emission device EL101, and then convert the photo energy ~~is converted~~ into a minimum drive voltage required ~~by the high input resistance transistor Q101~~ to drive the high input resistance transistor Q101; the electric energy driven light emission device EL101 ~~comprised of~~ including one or ~~more than one~~ light ~~emission~~ emitting diodes (LEDs), electric ~~bulb~~ bulbs, or any other type of photoelectric conversion device ~~is~~ matched to the ~~an~~ photoelectric conversion device PE101 in such a way that the photo energy outputted by the light emission device generates the minimum drive voltage required by the photoelectric conversion device PE101; one or more ~~than one~~ of the electric energy driven light emission devices EL101 ~~are~~ being used to drive one or more that one ~~the~~ photoelectric conversion device PE101, either individually or jointly; ~~or one or more than one electric energy driven light emission device EL101 are used to jointly drive the photoelectric conversion device PE101; or two or more than two electric energy driven light emission devices EL101 are used to respectively drive the photoelectric conversion device PE101; or two or more than two electric energy driven light emission devices EL101 are used to simultaneously drive two or more than two photoelectric conversion devices PE101; and one or more than one the electric energy driven light emission devices EL101 may be provided or not provided at all depending on the requirements of the circuit~~;

- a slave negative voltage supply ~~circuit~~ device VB101~~:~~ comprised of ~~solid status~~ a solid state or ~~mechanic electronic~~ electro-mechanical device to provide a negative voltage between the gate and source of the transistor upon cutting off ~~for~~ positive voltage transmission to the control gate ~~and emitter~~ of the high input resistance transistor Q101,

for facilitating ~~the~~ cutoff ~~to be executed by~~ of the high input resistance transistor Q101; wherein upon ~~the~~ delivery of the positive voltage electric energy signal controlling the drive, or when the photoelectric conversion device PE101 receives ~~the~~ photo energy emitted from the electric energy driven light emission device EL101 or from the environment to generate positive a voltage to drive the high input resistance transistor Q101, the slave negative voltage supply circuit device VB101 executes storage of negative voltage ~~at the same~~ by ~~means of~~ utilizing the electric energy of the inputted positive voltage signal so that when the positive voltage signal being transmitted ~~transmitting~~ to the high input resistance transistor Q101 is interrupted, the slave negative voltage supply circuit device VB101 inputs negative voltage to the controlling gate and ~~emitter~~ source of the high input resistance transistor QI0I to facilitate cut-off transition; the negative voltage electric energy of the slave negative voltage supply circuit device VB101 ~~may come from~~ being provided by ~~a photoelectric conversion device includes that from the~~ photoelectric conversion devices PEI0I, ~~or~~ by an independently provided photoelectric conversion device PE102, or ~~that~~ by positive voltage electric energy from ~~other~~ another drive signal source; and the negative voltage storage ~~is characterized by a mechanic-electronic~~ being in the form of an electro-mechanical device, an inductive device, a ~~capacity~~ capacitive device, a (dis)chargeable secondary battery, ~~or~~ a super capacitor, or any other type of electricity storage device ~~to store electric energy of~~ for storing the positive voltage electric energy required for driving the high input resistance transistor Q101;

- a ~~loading~~ load device LD101~~: includes~~ in the form of a load ~~generating~~ arranged to convert electrical energy into mechanical energy, ~~photo~~ light, ~~thermal~~ or heat, ~~or~~ a load arranged to provide an electrochemical effect ~~by inputting electric energy~~, ~~or~~ any other power load comprised of resistive, ~~capacity~~ capacitive, inductive ~~load~~ elements, ~~or~~ a transistor, a ~~or~~ diode or any other ~~solid status or mechanical electronic~~solid state or electro-mechanical load device, ~~or~~ any circuit ~~load functioning for~~ having the function of post amplification, ~~or~~ any load for signal transmission, or any load for data storage, ~~or~~

read-out, ~~or~~ elimination, ~~or~~ operation, ~~or~~ any load functioning as a detection circuit device, or any other circuit load ~~to be~~ subject to the control by the high input resistance transistor Q101.

By combining ~~those~~ the devices disclosed above, photoelectric conversion ~~devices~~ device PE101 ~~to~~ will generate a drive voltage under normal conditions of being subject to light ~~in parallel~~, while the slave negative voltage supply circuit device VB101 ~~and the electric energy driven light emission device EL101 which can be coupled to the photoelectric conversion device PE101 such as the light emission diode (LED) or electric bulb is,~~ provided between the gate and the ~~emitter from~~ source of a high input resistance transistor such as a micro or power type metal-oxide-silicon field effect transistor (MOSFET), ~~or an~~ insulated gate ~~bi-carrier~~ bipolar transistor (IGBT), or other type of high input resistance transistor or ~~modulus~~ module, stores electric energy to provide a cut-off voltage when photoelectric conversion by the conversion device PE101 ceases ~~so that when the electric energy driven light emission device EL101 emits the light, or when the photoelectric conversion device PE101 is excited by the environmental light source, a relative drive voltage signal is generated to drive the high input resistance transistor Q101~~.

The structural configuration of the photoelectric conversion drive circuit of the transistor is described as follows:

(1) Depending on ~~the~~ structural requirements, the electric energy driven light emission device EL101, the photoelectric conversion device PE101 and the slave negative voltage supply circuit device VB101 may be of individual structure, or mutually coupled, or partially or generally coupled to form a sealed configuration;

(2) Depending on ~~the~~ structural requirements, the electric energy driven light emission device EL101, the photoelectric conversion device PE101 and the slave negative voltage supply circuit device VB101 may be partially or generally separately provided or packed into a ~~modulus~~ module with the high input

resistance transistor Q101;

(3) Each and all related circuit devices may be directly connected or connected via an I/C or a PCB to form an open structure or a hybrid structure;

(4) A drive source for the energy driven light emission device EL101 referred in subparagraphs (1) , (2) and (3) may be of DC or AC source to drive ~~the~~ a bulb, ~~or comprised of DC electric energy driven~~ a DC source to drive a light emission diode (LED), or a laser light source or other electric energy excited electric energy driven light emission device, or ~~may be substituted with~~ a natural light source from the environment may be substituted.

The ~~essential composition of the~~ slave negative voltage supply circuit device VB101 provided in the photoelectric conversion drive circuit of the transistor~~, is characterized by that with~~ may be a combination of ~~mechanical-electronic~~ an electro-mechanical device or a solid-state device, with various types of electric energy of positive voltage ~~signal~~ functioning as the input drive for the high input resistance transistor Q101 and ~~are~~ at the same time being transferred to and stored in the slave negative voltage supply circuit device VB101 so to function as a negative voltage source ~~in helping~~ to assist in cutoff when the high input resistance transistor Q101 is cut off~~; it is also characterized by that by taking~~. The negative voltage supply circuit device VB101 takes advantage of the photo energy generated when the electric energy driven light emission device ~~is subject to a light for emitting the~~ emits light~~,~~ and the photoelectric conversion device PE101 or PE102 is excited to generate the positive voltage electric energy required to drive the high input resistance transistor ~~while~~, the positive voltage electric energy ~~is~~ being transferred to and stored in the slave negative voltage supply circuit device VB101 so to function as ~~the~~ a negative voltage source to help energy transformation when the high input resistance transistor Q101 is cut off~~;~~ ~~whereas the circuit structure for the formation of the~~. The slave negative voltage supply circuit device VB101 ~~is in great number~~ can take a variety of forms, and the following preferred embodiments are given only ~~for references to prove the feasibility of the slave~~

~~negative voltage supply circuit device VB101, and do not in any way limit the scope of its composition~~ as examples and not intended to be limiting:

a. As illustrated in Fig. 2, the slave negative voltage supply circuit is comprised of ~~the present invention in parallel with induction~~ a parallel-connected inductor. ~~Within,~~ The input end of the high input resistance transistor Q101 is used to connect an induction L101 in parallel so that when an interruption occurs in the external signal source or the positive voltage signal source used to drive the high input resistance transistor Q101 and supplied from the photoelectric conversion device PE101, ~~with selected output voltage coupled~~ as controlled by the electric energy driven light emission device EL101 ~~is interrupted~~, the induction L101 ~~then~~ generates ~~a~~ an inverse negative voltage and supplies it to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics;

b. Fig. 3 shows that a slave negative voltage supply circuit comprised of the present invention ~~is connected in parallel with induction~~ includes a parallel-connected inductor and capacitor. ~~Wherein, the~~ The input end of the high resistance transistor Q101 is connected in parallel with ~~an~~ induction L101 and capacitors C101 so that when an external signal source or the positive voltage signal source ~~used to drive the high input resistance transistor Q101~~ supplied from the photoelectric conversion device PE101, ~~with selected output voltage coupled~~ as controlled by the electric energy driven light emission device EL101, is interrupted, the induction L101 and the capacitor C101 connected in parallel are used to generate an inverse negative voltage and supply it to the input end of the high resistance transistor Q101 to improve its cutoff characteristics;

c. Fig. 4 shows ~~that~~ a slave negative voltage supply circuit ~~comprised of the present invention is connected in series with an~~ that includes a series-connected induction. ~~Within, the~~ The induction L101 is connected in series between the input of the high input resistance transistor Q101 and ~~a signal~~ the source of positive drive ~~positive~~ voltage so that when an external signal source or the

positive voltage ~~signal~~ source ~~used to drive the high input resistance transistor Q101~~ supplied from the photoelectric conversion device PE101, ~~with selected output voltage coupled~~ as controlled by the electric energy driven light emission device EL101 is interrupted, the induction L101 ~~is connected in series between the signal source of drive positive voltage and the high input resistance transistor Q101~~ generates an inverse negative voltage and supplies it to the input end of the high input resistance transistor Q101 to improve its cut off characteristics, ~~and~~ a secondary resistance R500 ~~may be~~ being optionally connected in parallel with both ends of the photoelectric conversion device PE101 as required to provide a loop for the inverse negative voltage;

d. As illustrated in Fig. 5, a slave negative voltage ~~the present invention is connected in series with~~ including a series-connected parallel combination of an induction L101 and ~~capacitors~~ capacitor C101 ~~connected in parallel~~ so that when an external signal source or the positive voltage ~~signal~~ source ~~used to drive the high input resistance transistor Q101~~ supplied from the photoelectric conversion device PE101, ~~with selected output voltage coupled~~ as controlled by the electric energy driven light emission device EL101, is interrupted, a parallel harmonic ~~oscillation~~ oscillator ~~is formed~~ comprising ~~of~~ the ~~induction~~ inductor L101 and ~~the capacitors~~ capacitor C101 in parallel is connected in series between the high input resistance transistor Q101 and the signal source of drive positive voltage, and an inverse negative voltage is generated and supplied to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics. ~~while a~~ A secondary resistance R500 may be connected as required in parallel with both ends of the photoelectric conversion device PE101 to provide a loop ~~of~~ for the inverse negative voltage;

e. Fig. 6 shows ~~that~~ a slave negative voltage supply circuit ~~is comprised of the present invention in series with~~ including a series-connected resistance and a secondary battery system. ~~Within, a combination of a resistance R400 and a~~

~~secondary electricity storage device ESD101 in parallel is comprised of having the~~ The secondary battery system ESD101 is comprised of ~~the~~ a capacitor or ~~the~~ a secondary (dis)chargeable battery and the resistance R400 in parallel, ~~to be~~ and is connected in series between the drive signal source and the input of the high input resistance transistor Q101., ~~and the~~ The secondary resistance R500 is connected in parallel with either side of a connection of the combination of the drive signal source and the resistance R400 ~~connected in parallel with the secondary electricity storage device ESD101~~ and another end ~~from~~ of the signal source of the drive positive voltage so ~~to have~~ as to permit the drive signal source or the photoelectric conversion device PE101 ~~with the selected output voltage coupled as controlled by the electric energy driven light emission device EL101 to~~ generate electricity when subject to light, and thus ~~to~~ generate a positive voltage to drive the high input resistance transistor Q101; ~~and in addition to driving the high input resistance transistor Q101,~~ the positive voltage also ~~forms~~ forming a voltage drop ~~to~~ across the resistance R400 ~~provided in the combination of the resistance R400 and the secondary electricity storage device ESD101 connected in parallel,~~ so to charge a ~~the~~ negative voltage into both ends of the secondary electricity storage device ESD101; ~~furthermore,~~ wherein when the ~~signal source of the~~ positive voltage is interrupted, the negative voltage stored in the secondary electricity storage device ESD101 forms, through the secondary resistance R500, a negative voltage and supplies it to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics;

f. Fig. 7 shows ~~that that~~ a slave negative voltage supply circuit ~~is~~ comprised of having the present invention connected in series with a combination of a zener diode and a secondary electricity storage device in parallel. ~~Within, a~~ The ~~combination of a resistance and a secondary electricity storage device in parallel is comprised of having the~~ secondary electricity storage device ESD101 is comprised of ~~the~~ a capacitor or ~~the~~ a secondary (dis)chargeable battery and a

parallel combination of a zener diode ZD101 and a secondary electricity storage device ESD101, ~~in parallel to be~~ which is connected in series between the drive signal source and the input of the high input resistance transistor Q101, and secondary ~~resistance~~ resistances R500 and R500' ~~are~~ respectively connected in parallel with both ends of the combination of the zener diode ZD101 ~~in parallel~~ and the drive signal source, so to have the drive signal source or the photoelectric conversion device PE101, ~~with the selected output voltage coupled~~ as controlled by the electric energy driven light emission device EL101, ~~to~~ generate electricity when subject to light, thus ~~to generate~~ generating a positive voltage to drive the high input resistance transistor Q101; and in addition to driving the high input resistance transistor Q101, the zener voltage of the zener diode ZD101 is used to form a voltage drop at both ends of the secondary electricity device ESD101 so to charge the negative voltage into both ends of the secondary electricity storage device ESD101. ~~; furthermore, when~~ When the signal source of the positive voltage is interrupted, the negative voltage stored in the secondary electricity storage device ESD101 forms, through the secondary ~~resistance~~ resistances R500 and R500', a negative voltage and supplies it to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics.

g. Fig. 8 shows ~~that~~ a slave negative voltage supply circuit ~~is comprised of the present invention connected in parallel with a~~ that includes a parallel-connected pressure effect device of a pre-stressed structure. ~~Within, a~~ The pressure effect device PZ101 ~~of pre-stressed structure~~ is connected in parallel between the drive signal source and the input end of the high input resistance transistor, ~~the pressure effect device includes~~ and includes any device with a pressure effect ~~and~~ that is pre-compressed by means of the pre-stressed structure so that it is normally under negative voltage status ~~when transmitted to the high input resistance transistor Q101, and~~ while the light emission device EL101 ~~from the~~

~~drive signal source~~ is used to control the operation of the photoelectric conversion device PE101 ~~with selected voltage coupled to it~~ to generate ~~electricity when subject to light for generating~~ a positive voltage ~~to~~ and drive the high input resistance transistor Q101; meanwhile, by taking advantage of ~~such~~ the pressure effect, the pressure effect device PZ101 indicates its transformation in ~~opposite~~ opposition to the pre-stressed direction so that when the positive voltage drive signal is interrupted, the pressure effect device PZ101 ~~indicates a status of~~ supplies a negative voltage ~~against~~ to the input end of the high input resistance transistor Q101 by pre-stress restoration for improving its cutoff characteristics;

h. Fig. 9 shows ~~that~~ a slave negative voltage supply circuit ~~is~~ comprised of ~~the present invention and a~~ an inverse series-connected photoelectric conversion device ~~connected in series of inverse polarity with~~ having a polarity opposite to that of the drive signal. ~~Within, the~~ More specifically, the photoelectric conversion device PE101 with selected output voltage is connected in series of inverse polarity between the drive signal source and the input of the high input resistance transistor, and the secondary electricity storage device ESD101 comprised of a capacitor or a secondary (dis) chargeable battery is connected in parallel with both ends of the photoelectric conversion device~~,~~ ~~or a~~ A secondary resistance R600 may be further connected in parallel as required while the electric energy driven light emission device EL101 is coupled, in parallel with the input end of the drive signal, ~~is coupled~~ to the photoelectric conversion device PE101. In addition to driving the high input resistance transistor Q101, the input of electric energy from the positive voltage signal also causes the electric energy driven light emission device EL101 to emit ~~the~~ light at the same time so as to excite the photoelectric conversion device PE101 for generating ~~output of~~ a negative voltage output and ~~charging~~ charge the secondary electricity storage device ESD101, provided that upon the electric energy of the positive voltage

signal being interrupted, the secondary electricity storage device ESD101 delivers a negative voltage into the input end of the high input resistance transistor Q101 to improve its cutoff characteristics;

i. Fig. 10 shows that a slave negative voltage circuit ~~is~~ comprised of a zener diode and capacitors connected in series at the output end of the photoelectric conversion device coupled to the electric energy driven light emission device of the present invention. ~~Within, the~~ The drive signal source is used to drive the electric energy driven light emission device EL101 to excite the photoelectric conversion device PE101 with selected output voltage coupled to the electric energy driven light emission device EL101, and a zener diode ZD101 and the secondary electricity storage device ESD101 comprised of a capacitor or a secondary (dis)chargeable battery connected in parallel with both ends of the zener diode are connected in series between the photoelectric conversion device and the input end of the high input resistance transistor Q101, so that ~~upon the~~ a positive driving voltage is generated when electric energy from an external signal source is inputted, or when the photoelectric conversion device PE101 coupled as controlled by the electric energy driven light emission device EL101 generates electricity, ~~for being subject to the light~~ to drive the high input resistance transistor Q101 through the zener diode ZD101, and to charge the secondary electricity device ESD101 in parallel with both ends of the zener diode ZD101; ~~when~~ When the signal of positive voltage is interrupted, the secondary electricity device ESD101 ~~indicates input of~~ inputs a negative voltage to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics; ~~if~~ If required, the secondary resistance R500 ~~maybe~~ may be connected in parallel with the output end of the photoelectric conversion device;

j. Fig. 11 shows ~~that~~ an embodiment in which the electric energy driven light emission device provided at the signal source of the present invention is used to simultaneously excite two photoelectric conversion devices connected in series

~~of~~ with inverse polarity ~~that are~~ and coupled to the electric energy driven light emission device while an electricity storage device circuit for negative voltage is also provided. ~~Within, the~~ The drive signal source is used to drive the electric energy driven light emission device EL101 to excite the two photoelectric conversion devices PE101 and PE102 ~~of~~ having different values of rated output voltage ~~connected in series of inverse polarity and indicating input polarity of negative voltage with the input end of the high input resistance transistor Q101 in the photo energy driven light emission device~~, the secondary electricity storage device ESD101 being comprised of capacitors or ~~the~~ a secondary (dis) chargeable battery ~~is~~ connected in parallel with both output ends of the photoelectric conversion device PE102 having the lower rated output voltage~~;~~ such that upon the input of electric energy from the positive voltage signal, the electric energy driven light emission device EL101 is excited to emit light, and both of the two photoelectric conversion devices PE101 containing higher rated output voltage and PE102 having the lower rated output voltage that are connected in series in inverse direction and coupled to the electric energy driven light emission device EL101 are excited to generate electricity at the same time~~;~~. ~~meanwhile~~ Meanwhile, the circuit ~~indicates~~ supplies, at the input end of the high input resistance transistor Q101, a positive voltage input of the voltage difference between the two photoelectric conversion devices PE101 and PE102 so to ~~conduct~~ cause the high input resistance transistor Q101 to conduct and ~~to~~ execute negative voltage charging on the secondary electricity storage device ESD101~~, then~~. Then, the electric energy is outputted through the secondary resistance R500 to the high input resistance transistor Q101 to facilitate its cut-off ~~conduction; furthermore,~~. ~~the~~ The secondary resistance R500' may be connected in parallel with both ends of the secondary electricity storage device ESD101 as required by the circuit;

k. Fig. 12 shows another example of ~~the~~ using an electric energy driven light

emission device provided at the signal source of the present invention ~~is used~~ to simultaneously excite two photoelectric conversion devices connected in series of inverse polarity ~~that are~~ and coupled to the electric energy driven light emission device while an electricity storage device circuit for negative voltage is also provided. ~~Within, the~~ The drive signal source is used to drive the electric energy driven light emission device EL101 to excite the two photoelectric conversion devices PE101 and PE102 with selected output voltage connected in series of inverse polarity ~~and indicating input polarity of negative voltage with~~ and arranged to supply the input end of the high input resistance transistor Q101 in the photo energy driven light emission device with a negative voltage, ~~the~~ a secondary electricity storage device ESD101 being comprised of capacitors or ~~the~~ a secondary (dis)chargeable battery ~~is~~ connected in parallel with both output ends of the photoelectric conversion device PE102 and ~~is~~ further connected in parallel with the zener diode ZD101 having its zener voltage lower than the rated voltage of the photoelectric conversion device PE101.; ~~upon~~ Upon ~~the~~ input of electric energy from the positive voltage signal, the electric energy driven light emission device EL101 is excited to emit light, and both of the two photoelectric conversion devices PE101 and PE102 that are connected in series in inverse direction and coupled to the electric energy driven light emission device EL101 are excited to generate electricity at the same time~~; meanwhile~~. Meanwhile, the circuit ~~indicates~~ provides at the input end of the high input resistance transistor Q101 a positive voltage input through the zener diode ZD101 to ~~conduct~~ cause conduction of the high input resistance transistor Q101 and to execute negative voltage charging ~~on~~ of the secondary electricity storage device ESD101 connected in parallel with both ends of the zener diode.; ~~when~~ When the electric energy from the positive voltage signal is interrupted and the electric energy driven light emission device EL101 stops light emission, the electric energy of negative voltage from the secondary electricity storage device ESD101 is

outputted through the secondary resistance R500 connected in parallel with both ends of the photoelectric conversion device PE101 to the high input resistance transistor Q101 to facilitate its cut-off ~~conduction~~;

l. As illustrated in Fig. 13, a circuit of the present invention is comprised of two electric energy driven light emission devices EL101 and EL102 ~~driven by selected electric energy polarity adapted with~~ and two photoelectric conversion devices PE101, PE102 connected in parallel ~~of~~ with inverse polarity. ~~Within, the~~ The two electric energy driven light emission devices EL101 and EL102 are driven by ~~2 -way~~ a two-way drive signal source, and the two photoelectric conversion devices PE101 and PE102 with selected output voltage are connected in parallel ~~of~~ with inverse polarity and coupled to the two electric energy driven light emission devices EL101 and EL102 ~~are used~~ in order to output a positive voltage to the input end of the high input resistance transistor Q10l. When the input signal source ~~relates to~~ is a positive conduction signal ~~to drive~~ that causes the positive conduction electric energy driven light emission device EL101 to emit ~~thelight~~ light, ~~thus to cause~~ the photoelectric conversion device PE10l coupled to it ~~also excited for light emission to generate~~ generates electric energy of positive polarity to drive the high input resistance transistor Q10l to ~~be conducted~~ conduct.; ~~when~~ When the positive signal from the input signal source is cut off and turned into a negative signal, the electric energy of positive polarity outputted to the high resistance transistor is cut off ~~while the other unit for cutoff~~, i.e. the electric energy driven light emission device EL102 emitting the light in inverse direction emits ~~the~~ light~~, thus~~ to excite the photoelectric conversion device PE102 coupled to it for emitting ~~the~~ light to generate electric energy of negative polarity ~~outputting~~ ,which is output to the input end of the high input resistance transistor Q101 for improving its cutoff characteristics;

m. Fig. 14 shows ~~that~~ a circuit comprised of two individual electric energy driven

light emission devices ~~is~~ used to control the operation of two photoelectric conversion devices connected in parallel ~~of~~ with inverse polarity. ~~Within, the~~ The two individual electric energy driven light emission devices EL101 and EL102 are driven by a ~~2-way~~ two-way drive signal source, and the two photoelectric conversion devices PE101 and PE102 are provided with a selected output voltage and connected in parallel ~~of~~ with inverse polarity ~~are used to~~ for output to ~~where between~~ input ends of the high input resistance transistor Q101. When the input signal source ~~relates to~~ provides a positive conduction signal to drive its matching electric energy driven light emission device EL101 ~~to be excited for emitting the light~~, the photoelectric conversion device PE101 coupled to it generates electricity ~~from receiving the light to generate electric energy~~ of positive polarity to drive the high input resistance transistor Q101 ~~for it~~ to turn on ~~to be conducted; when~~. When the positive signal from the input signal source is cut off and turns into a negative signal, the electric energy of positive polarity outputting to the high input resistance transistor Q101 is also cut off while the other photoelectric conversion device PE102 used also for cutoff starts to emit ~~the~~ light to generate electric energy of negative polarity for outputting to the input end of the high input resistance transistor Q101 to improve its cutoff characteristics;

n. Fig. 15 shows ~~that~~ a circuit ~~of~~ according to the present invention that controls t/he operation of two photoelectric conversion devices ~~indicating~~ of inverse polarity ~~with~~ using two individual light emission devices driven by electric energy. ~~Within,~~ The two respectively provided electric energy driven light emission devices EL101 and EL102 are driven by a two-way drive signal source, and two photoelectric conversion devices PE101 and PE102 with selected output voltage are connected in series ~~of~~ with inverse polarity and coupled to the two individual electric energy driven light emission devices EL101 and EL102 ~~are used to output to where between the input ends of the high input resistance transistor~~

~~Q101~~. When the input signal source ~~relates to~~ provides a positive conduction signal to drive its matching electric energy driven light emission device EL101 ~~to be excited for emitting the light~~, the photoelectric conversion device PE101 coupled to it generates ~~electricity from receiving the light to generate~~ electric energy of positive polarity to drive the high input resistance transistor Q101 ~~for it to turn to be conducted~~ to conduct.; ~~when~~ When the positive signal from the input signal source is cut off and turns into a negative signal, the electric energy of positive polarity outputting to the high input resistance transistor Q101 is also cut off while the other photoelectric conversion device EL102 used ~~also~~ for cutoff starts to emit ~~the~~ light to generate electric energy of negative polarity for outputting to the input end of the high input resistance transistor Q10l to improve its cutoff characteristics. The individual output end of the two photoelectric conversion devices connected in series of inverse polarity may be respectively connected in parallel with ~~the resistance~~ resistances R500 and R500' as required;

o. Fig. 16 shows ~~a first~~ another preferred embodiment of the present invention provided with a source of negative polarity. ~~Within, a~~ A fixed source or a drive signal is used to drive an electric energy driven light emission device EL102 to generate photo energy for exciting the photoelectric conversion device PE102 ~~for generating~~ and generate electric energy of negative polarity that is coupled to the electric energy driven light emission device EL102~~, while the drive signal source is directly inputted or drives~~ to control the operation of the electric energy driven light emission device EL101 ~~to relatively~~ and thereby generate photo energy for exciting the photoelectric conversion device PE101 coupled to it ~~and provided for generating~~ to generate electric energy of positive polarity~~, then~~. Then, the photo energy is further outputted to the input end of the high input resistance transistor Q101, with both input ends of the high input resistance transistor Q101 connected in parallel and

further connected in series with a secondary resistance R700 and another resistance R700'.~~; and the~~ The photoelectric conversion device PE102 provided for generating electric energy of negative polarity ~~indicates~~ has an inverse polarity ~~to be connected in parallel with~~ connection to the secondary resistance R700' for constantly ~~indicating~~ supplying electric energy of negative polarity to the input end of the high input resistance transistor Q101. When the drive signal source is interrupted, the electric energy of positive polarity outputted to the high input resistance transistor Q101 is also cut off, and the electric energy of negative polarity outputted from the photoelectric conversion device PE102 is conducted to the high input resistance transistor Q101 to improve its cutoff characteristics.~~; the~~ The ~~-~~fixed source may come from a main power line, ~~or~~ a dedicated secondary power source, or a secondary source shared by ~~other~~ another source circuit;

p. Fig. 17 shows ~~a second~~ another preferred embodiment of the present invention provided with a source of negative polarity. ~~Within, a~~ A fixed source or a drive signal is used to drive an electric energy driven light emission device EL102 to generate photo energy for exciting the photoelectric conversion device PE102 ~~for generating~~ to generate electric energy of negative polarity that is coupled to the electric energy driven light emission device EL102, while the drive signal ~~source~~ is directly inputted ~~or drives~~ to control the operation of the electric energy driven light emission device EL101 ~~to relatively~~ and generate photo energy for exciting the photoelectric conversion device PE101 coupled to it and ~~provided~~ providing for generating electric energy of positive polarity. The~~, then the~~ photo energy is further outputted to the input end of the high input resistance transistor Q101 with both input ends of the high input resistance transistor Q101 connected in parallel with a circuit comprised of a secondary resistance R700 and the secondary electricity device ESD101 connected in series; ~~and~~ the photoelectric conversion device PE102 provided for generating electric energy of negative

polarity ~~indicates inverse polarity to be~~ being connected in parallel with the secondary electricity storage device ESD101 for constantly ~~indicating~~ supplying electric energy of negative polarity to the input end of the high input resistance transistor Q101. When the drive signal source is interrupted, the electric energy of positive polarity outputted to the high input resistance transistor Q101 is also cut off, and the electric energy of negative polarity outputted from the photoelectric conversion device PE102 is conducted to the high input resistance transistor Q101 to improve its cutoff characteristics~~; the~~. The fixed source may come from a main power line, ~~or~~ a dedicated secondary power source, or a secondary source shared by ~~other~~ another source circuit, and a secondary resistance R700' may be ~~or may not be respectively~~ provided ~~to~~ at both ~~ends~~ of the photoelectric conversion device PE102; and

q. Fig. 18 shows ~~a third~~ yet another preferred embodiment of the ~~presentation~~ invention that is provided with a power source of negative polarity. ~~Within, a~~ A fixed source or a drive signal is used to drive an electric energy driven light emission device EL102 to generate photo energy for exciting the photoelectric conversion device PE102 ~~for generating~~ and generate electric energy of negative polarity that is coupled to the electric energy driven light emission device EL102, while the drive signal source is directly inputted or ~~drives~~ driven to control the operation of the electric energy driven light emission device EL101 to relatively generate photo energy

for exciting the photoelectric conversion device PE101 coupled to it and ~~provided for generating~~ generate electric energy of positive polarity~~, when~~. When both output ends of the photoelectric conversion device PE101 ~~is~~ are connected in parallel with the secondary resistance R700, and then further connected in series with the photoelectric conversion device PE102 of inverse polarity and inputted to the input end of the high resistance transistor Q101, the ~~voltage of~~ rated output ~~electric energy~~ voltage of the photoelectric conversion device

PE102 ~~provided for generating the electric energy of negative polarity~~ is lower than the ~~voltage of the~~ rated output voltage of the photoelectric conversion device PE102 ~~constant to its inputted electric energy of negative polarity without affecting the~~ and control by the drive signal over the operation of the high input resistance transistor Q10l if not affected. When the drive signal source is interrupted, the electric energy of positive polarity outputted to the high input resistance transistor Q101 is also cut off, and the electric energy of negative polarity is outputted to the high input resistance transistor Q101 to improve its cutoff characteristics~~; the~~. The fixed source may come from a main power line, ~~or~~ a dedicated secondary power source, or a secondary source shared by ~~other~~ anther source circuit, and a secondary resistance R700' may be ~~or may not be~~ respectively provided ~~to~~ at both ends of the photoelectric conversion device PE102.

As disclosed above, the photoelectric conversion transistor drive circuit ~~of the transistor~~ uses an electric energy driven light emission device or a natural light source from the environment as the working light source to control the operation of a photoelectric conversion device which, when coupled to ~~it~~ the light emission device, ~~and~~ generates a drive voltage ~~when subject to light and the operation of its adapted~~ and charges slave negative voltage supply circuit device VB101, ~~thus to constitute~~ thereby providing a pilot drive circuit of a high input resistance transistor, such as a micro type or power type metal-oxide-silicon field effect transistor (MOSFET), ~~or~~ an insulated gate ~~bi-carrier~~ bipolar transistor (IGBT), or any other high input resistance transistor or ~~modulus~~ module ~~so that a high input resistance transistor, such as a micro type or power type metal-oxide-silicon field effect transistor (MOSFET) or an insulated gate bi-carrier transistor (IGBT) or any other high input resistance transistor achieves~~ to achieve excellent control and operation either in the drive mode ~~of drive~~ or during cutoff.